

## Steerable Antegrade Stenting: A New Trick of the Trade

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### ABSTRACT

*Introduction:* Whereas a retrograde attempt to insert an indwelling stent is performed in lithotomy position, usually renal access is gained in a prone position. To overcome the time loss of patient repositioning, a renal puncture can be performed in a modified lithotomy position with torqued truncus and slightly elevated flank. There is a two-fold advantage of this position: transurethral and transrenal access can be obtained using a combined approach. In the present study, this simple technique is used to position a floppy guide wire through a modified needle directly through the renal pelvis into the ureter.

*Materials and Methods:* The kidney is punctured in the modified lithotomy position under sonographic control using an initial three-part puncture needle. A floppy tip guide-wire is inserted into the collecting system via the needle after retrieving the stylet. The retracted needle is bent at the tip while the guide-wire is secured in the needle and the collecting system. The use of the floppy tip guide-wire helps to insert the curved needle back into the kidney pelvis, which becomes the precise guidance for the now steerable wire. The desired steerable stent is positioned under radiographic control in a retrograde fashion over the endoscopically harbored tip of the guide-wire. Two patient cohorts (newly described method and conventional method) were compared.

*Results:* The presented steering procedure saves 16.5 mean minutes compared to the conventional antegrade stenting and 79.5 Euros compared to the control group.

*Conclusion:* The described combined antegrade-retrograde stent placement through a bent three-part puncture needle results in both clinical superiority (OR time, success rate) and financial benefits.

*Key words:* ureter; stent; nephrostomy; kidney

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### INTRODUCTION

Retrograde ureteral stenting is a daily routine in endourologic procedures. Large prostatic glands, transitional cell carcinoma of the bladder, impacted ureteral stones, kidney transplants and orthotopic as well as incontinent diversions belong to those challenging cases, where a successful retrograde stenting is not always possible; especially if the ureteral ori-

ifice is involved in a pathological process, antegrade access is sometimes preferable.

The technique of antegrade stent placement has been in the armamentarium of endourologists for decades. Three critical steps are necessary to be successful: 1) access of the collecting system, 2) introduction of a guide-wire into the ureter and 3) passage of the ureteral segment that could not be passed in a retrograde fashion.

Whereas a retrograde attempt to insert an indwelling stent is normally done in the lithotomy position, usually renal access is gained in the prone position. To overcome the time loss of patient repositioning, the renal puncture can be performed in a modified lithotomy position with a slightly elevated flank. A major advantage of this position is the combined approach transurethral and transrenal access (1).

This position, in particular, is the easiest way to gain a safe access below the 12<sup>th</sup> rib, in the lower or middle calyx, resulting in an unfavorable angle to the pyeloureteral junction. Many different techniques are reported to solve this issue, such as j-shaped ureteral catheters, “cobra” or “hook”-angiographic catheters, bent wires, peel-away sheaths, assistance of rigid or flexible nephroscopes and dozens of other more or less useful and expensive tools (2).

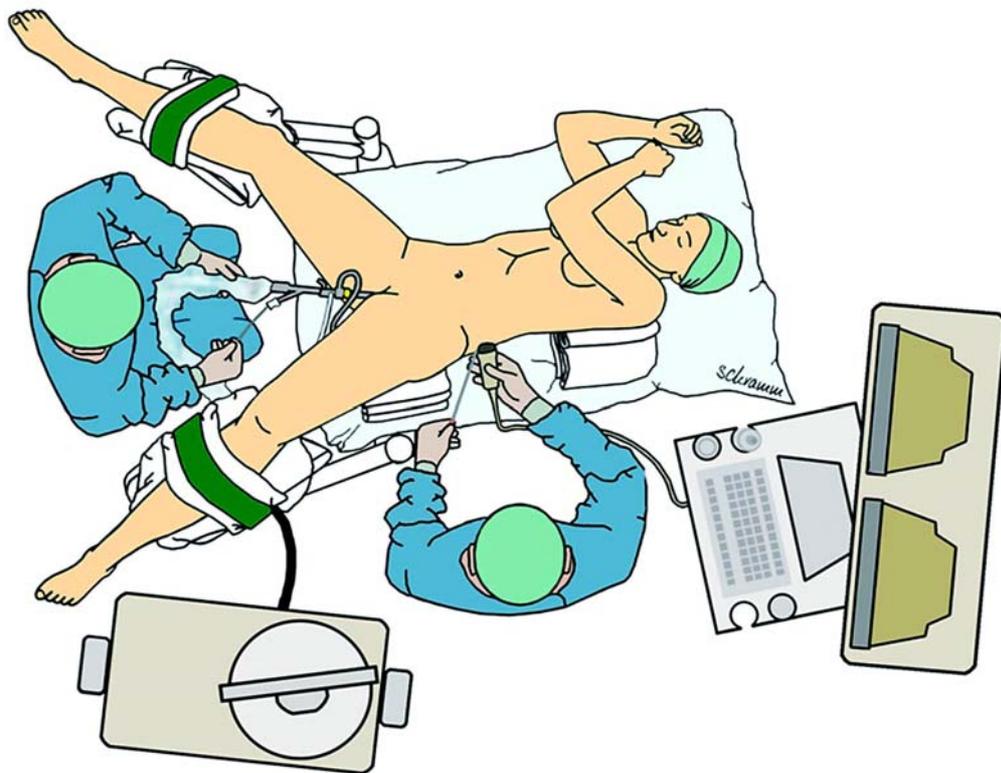
This study demonstrates a simple technique by using only the puncture needle and a floppy guide-wire to pass the guide-wire into the pyeloureteral junction.

## MATERIALS AND METHODS

### Patients Recruitment

A retrospective chart review was performed on 14 consecutive patients receiving an indwelling ureteral stent using the presented technique, which were compared to the following 15 consecutive patients, who received the stent in the conventional technique with the additional nephrostomy tube. Mean age in this group was 65.5 years (control group 67.5 years). Four patients had acute urinary retention (control = 6) and 10 had chronic hydronephrosis (control = 9), caused by malignancy in 6 patients (control = 6) vs. benign disease in 4 cases (control = 3).

OR time (puncture to successful introduction of the guide-wire in the ureter), success rate of the intubation of the proximal ureter, blood transfusions as well as complications in both groups were recorded and analyzed. Costs for each procedure were recorded and comparatively evaluated.



**Figure 1** – Patient position on the table with both transurethral and percutaneous access.



**Figure 2** – Original (left) and bent (right) puncture needle both with stylet.

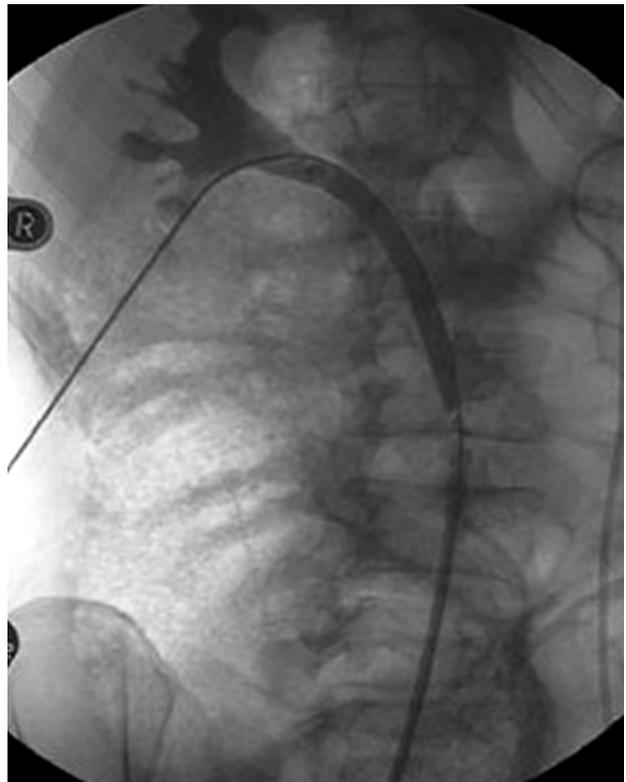
### Surgical Technique

The patient is paced in a lithotomy position and the patient is slightly elevated at the site of the potential kidney puncture (Figure-1). A retrograde evaluation of the ureter is done. After deciding to use an antegrade or combined approach to place a ureteral stent, the kidney is punctured under sonographic control with a three-part puncture needle (Bard GMBH, Karlsruhe, Germany) 1.3 mm in diameter with MS-cut, thus facilitating visibility in the ultrasound. Urine is collected for culture before radiopaque contrast medium is injected into the renal cavity. The renal pelvis, pyeloureteral junction and calyces are identified; a sensor guide-wire (Boston Scientific, Nanterre Cedex, France) with a hydrophilic floppy tip is inserted into the collecting system via the needle after retrieving the stylet.

The retracted needle is bent at the tip at about 3-4 cm length in a smooth curvature (Figure-2) while the guide-wire is secured in the needle as well as in the collecting system. The use of the floppy wire results in the possibility of inserting the curved needle once again into the kidney as the needle acts as a precise guidance for the now steerable floppy guide-wire (Figure-3).

The wire is guided through the ureter into the bladder and preferably harbored with an extracting forceps. The end of the guide-wire is secured with a clamp at the skin level and the desired steerable stent is positioned under radiographic control in a retrograde fashion over the harbored tip of the guide-wire. Finally, the wire is extracted through the puncture and the stent is released in its correct position.

In the standard technique, a peel-away sheath is inserted after placing the guide-wire in the calyceal system and either a “billiard-like” procedure with the floppy wire or an attempt with angiographic catheters is used to intubate the ureter. After harboring the guide-wire through the meatus, the stent is placed in the same way as mentioned above and a 9 Fr. Pigtail nephrostomy is placed in the renal pelvis for at least one day.



**Figure 3** – Placing the floppy guide-wire into the ureter with bent needle through the lower calyx in modified lithotomy position.

A Foley catheter is placed in the bladder and a perioperative prophylaxis is administered with a twice-daily oral application of 250 mg ciprofloxacin.

## RESULTS

With the new procedure, a puncture of the lower calyx was achieved in 7 cases and the middle calyx or renal pelvis in 7 patients. Direct access into the ureter was gained in 1 case. In one case, primary access was not possible due to an infundibulo-ureteral angle of less than 20° (on antegrade pyelography). After dilatation of the access tract, a metal 15 F nephroscope sheath was inserted and intubation was facilitated by flexible nephroscopy. In 10 of the 14 cases, the placement of the wire into the bladder and therefore combined stenting was possible. After successful stenting, no nephrostomy tube was required after removal of the guide-wire. OR time (puncture to intubation of the proximal ureter) was 9.5 minutes.

In the control group, the lower calyx was punctured in 7 cases and the middle calyx or renal pelvis in 8 cases. Accidental direct access was gained one time, whereas dilatation of the nephrostomy tract, insertion of a peel-away sheath and guidance with angiographic catheters was successful in 9 and aided by flexible ureteroscope (Flex-x, Storz, Tuttlingen, Germany) in 3 cases. OR time (puncture to intubation of the proximal ureter) was performed in an average in 26 minutes.

The nephrostomy tube was extracted the first postoperative day in all cases in the control group.

Mean additive costs in the control cohort were 79.5 euros. The higher costs were caused by the use of nephrostomy tube, peel-away sheath, and angiographic catheter.

Mechanical problems of the needles were not observed after bending (e.g. broken needles, cut wires, etc).

Fever did not occur in either the study nor in the control group; no major complications were reported and no blood transfusions were necessary.

## COMMENTS

Using the new torqued lithotomy position facilitates fast access in all patients including the control

group. This technique requires an ultrasound guided puncture because of the inability to sufficiently contrast the collecting system in a retrograde fashion. Another positioning with prone split leg and flank roll position is reported by Grasso et al. (3). The advantages of the technique described here, compared to the approach of Grasso, are easier positioning of the patient and facilitated access with semi-rigid instruments, whereas only radiographic controlled puncture is more difficult.

The use of floppy tip guide-wires avoided accidental puncture of the contra-lateral wall of the renal pelvis, which resulted in extravasation and therefore bad vision after application of radiopaque contrast medium.

Surprisingly, about 7% (n = 1) of initial guide-wire placements resulted in direct intubation of the ureter in both patient groups; in all other patients the presented steering procedure resulted in major time saving (16.5 minutes).

In comparison with another published approach by a radiologist with a success rate of 88% using pre selected patients, 57% were excluded and a two stage approach was performed later (4). The presented approach, which has been performed many times, provides the urologist in even more sophisticated cases (e.g. tumor, stricture etc.) the potential to perform a one-stage procedure with the possibility of frequent immediate transurethral intervention.

The use of a combined approach is initially presented by Wirth et al. (5). The dilatation of the access tract using the bent needle as a steering guide was less traumatic. This results in a safe approach to retract the guide-wire without the need of a nephrostomy or sealing of the tract by gelatine matrix haemostatic sealant (6). The average cost saving of the steerable approach is 79.5 Euro.

Additional placement of an indwelling stent in the same session, in case of failed retrograde attempt and without time loss caused by patient repositioning, further reduces hospital and especially OR time related costs (2).

## CONCLUSION

The described combined antegrade-retrograde stent placement by using a bent initial three-

part puncture needle instead of the common equipment and technique of antegrade stenting results a better clinical outcome (OR time, success rate) and financial benefit.

## ACKNOWLEDGEMENT

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## CONFLICT OF INTEREST

None declared.

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## EDITORIAL COMMENT

This paper introduces a technique of antegrade double-J ureteral stent placement in a single session, for cases in which retrograde access is not possible. The proposed simultaneous cystoscopic and percutaneous renal access method affords greater safety compared to antegrade fluoroscopic guidance alone.

The real benefit of positioning the patient in this manner is that percutaneous access can be obtained if an initial attempt at retrograde ureteral stenting fails. Traditionally, the patient would have to be repositioned prone, or awakened for referral to the interventional radiologists for percutaneous nephrostomy tube placement.

One limitation of this technique is that some urologists do not routinely perform sonographically guided renal puncture. Another point of caution is that in the patient with urosepsis from obstructive

uropathy, initial percutaneous nephrostomy drainage is warranted, rather than trying to place a ureteral stent across the obstructed segment in a single setting.

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## EDITORIAL COMMENT

The combination of retrograde and antegrade procedures for ureteral stenting, especially in difficult cases, such as patients with ureteral strictures and urologic lesions, where conventional stenting has failed, has been previously described in the literature (1,2). The “rendezvous technique”, as so elegantly described, is a well-established technique in order to increase the success rates, even in antegrade stenting procedures (3). The loss of time in repositioning the patient from prone to lithotomy position is sometimes an issue, particularly in countries where the concept of reducing operative time is of great importance. The present study, which is evaluating the potential of a renal access in a slightly modified lithotomy position, combining transurethral and transrenal approach at the same time, is worthy of noticing.

The authors are presenting a punctured technique in a one-stage procedure that seems feasible and convenient to perform, reducing the time of the process, with the possible accumulation of a financial benefit. Nevertheless, the exclusive requirement of ultrasound guidance and the small number of cases, whereas patient selection criteria were not unequivocally clarified, necessitate the further evaluation of this method in the field of ureteral stenting.

Antegrade stent placement is a well-established procedure, which can manage ureteral strictures and obstruction with great success (4,5). This newly described technique, that facilitates the transurethral and transrenal approach at the same time,

can only offer another valuable implement to the arsenal of the endourologists and we believe that in time will prove its merit in selected cases.

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